



# ***NASA WxAP Review***

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## **FAA Programs / Plans**

### **Weather Products And Weather Data Link Communications**

Alfred Moosakhanian, FAA/AUA-460  
WARP & FISDL Program Manager  
(202) 493-0043 [alfred.moosakhanian@faa.gov](mailto:alfred.moosakhanian@faa.gov)

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# Overview

## FAA Programs of Interest



### Weather Products



#### R&D

- ★ Aviation Weather Research Program (AWRP)



#### NAS Platforms – Product Use/Dissemination

- ★ Weather and Radar Processor (WARP)
- ★ Integrated Terminal Weather System (ITWS)
- ★ Operational and Supportability Implementation System (OASIS)



### Weather Data Link



#### Flight Information Services Data Link (FISDL)



#### FIS-B (Safe Flight 21)



#### NEXCOM



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# ***Aviation Weather Research Program (AWRP)***






# ***Aviation Weather Research Program(AWRP)***

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## **Objectives:**

-  To provide accurate and accessible weather products for users of the National Airspace System
-  To reduce weather-related accidents and incidents
-  To relieve weather impact on system capacity and efficiency



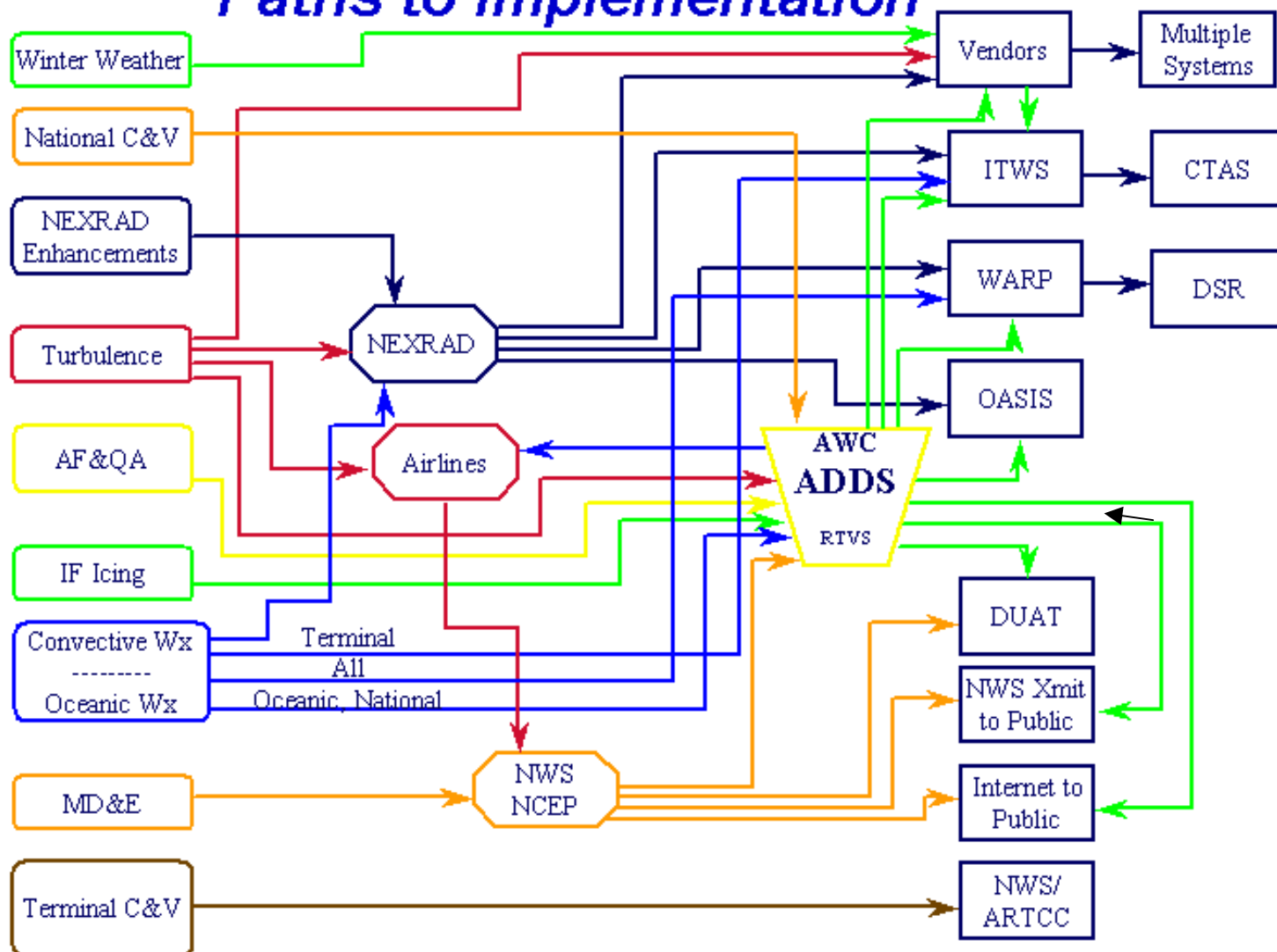
## **Approach**

-  Ten (10) Product Development Teams
  -  Conduct R&D to develop more accurate and more accessible weather observations, warnings, and forecasts



# AWRP NAS Implementation

## Paths to Implementation





# ***AWRP Accomplishments***

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## **FY02 Accomplishments:**

- ⚡ Current Icing Potential (CIP) in-flight icing product became operational in March 2002
- ⚡ Rapid Update Cycle 20 (RUC20) numerical forecast model became an operational product in April 2002
- ⚡ National Ceiling and Visibility product approved by FAA/NWS board for test use
- ⚡ Oceanic Cloud Top Height product approved by FAA/NWS board for test use







# ***AWRP Goals***

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## **FY03 Goals:**



-  Obtain FAA/NWS board approval for turbulence forecasting product for operational use
-  Obtain FAA/NWS board approval for in-flight icing forecast product for operational use
-  Transition the marine stratus burn off forecast product to operational use
-  Produce a 2-hour regional convective weather forecast for the corridor integrated weather system





# ***AWRP Technology Developments***

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## **Near-Term (1-2 years)**

-  Ability to forecast growth and decay of convective weather
-  Downlink of real-time in-flight icing and turbulence data for use in diagnostics and forecasts

## **Mid-Term (3-5 years)**

-  Implementation of the Weather Research and Forecasting (WRF) model
-  Operational National Ceiling and Visibility and Oceanic Weather products





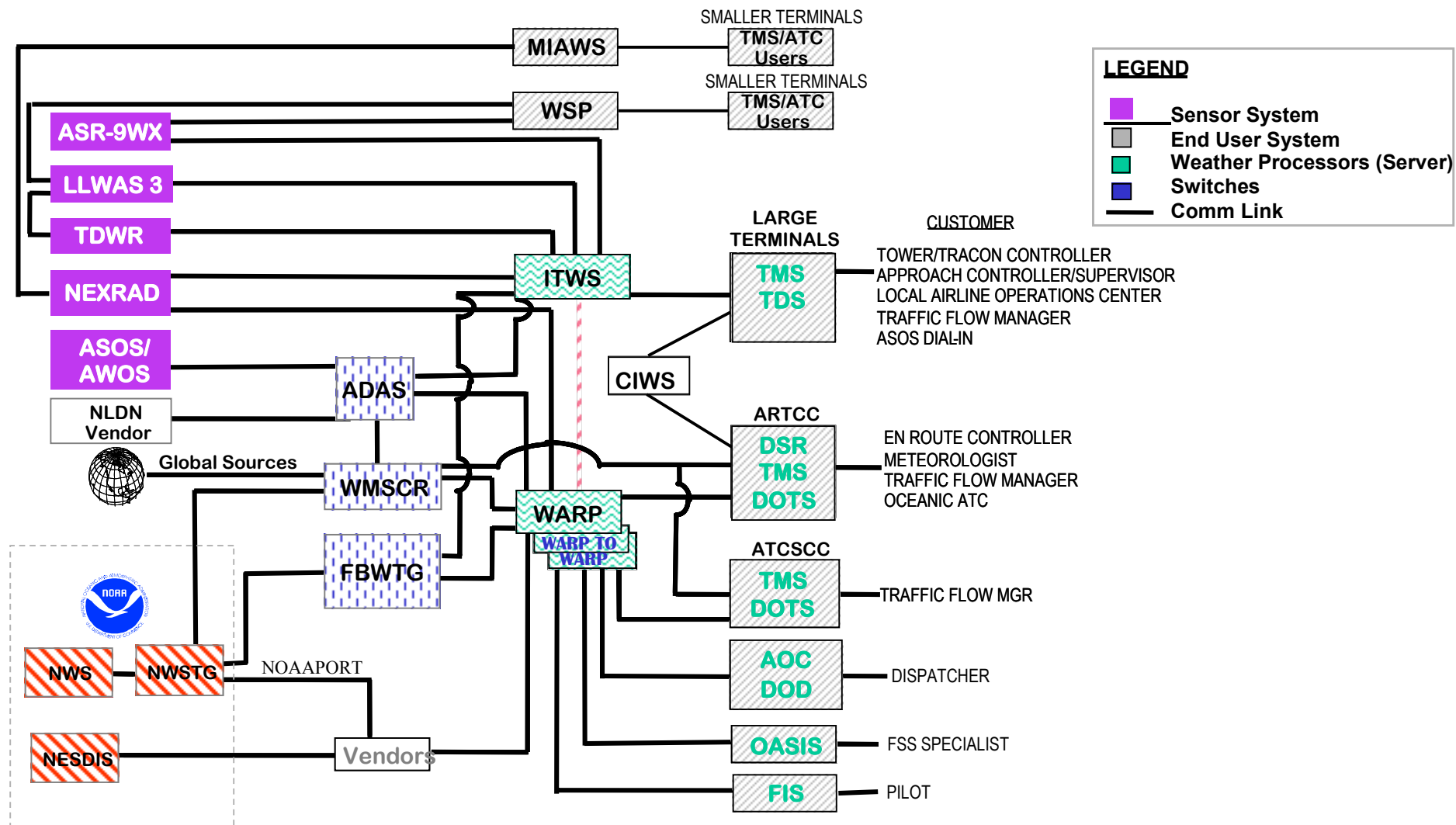
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## ***NAS Platforms***

### ***Weather Product Use/Dissemination***






# Near-Term NAS Weather Architecture





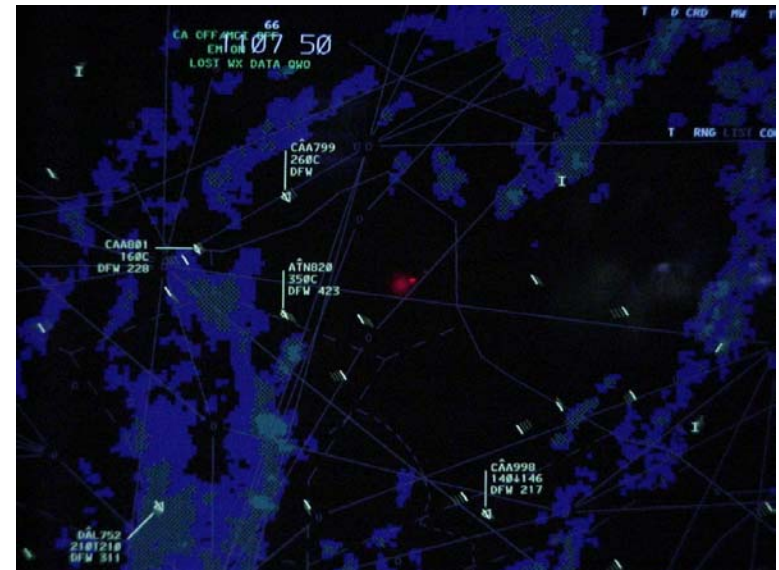
# ***Weather and Radar Processor (WARP)***

## **Objectives**

-  Meteorological Platform for CWSU
-  Provide Weather Radar Data to DSR
-  Provide Weather Data to Other NAS Systems



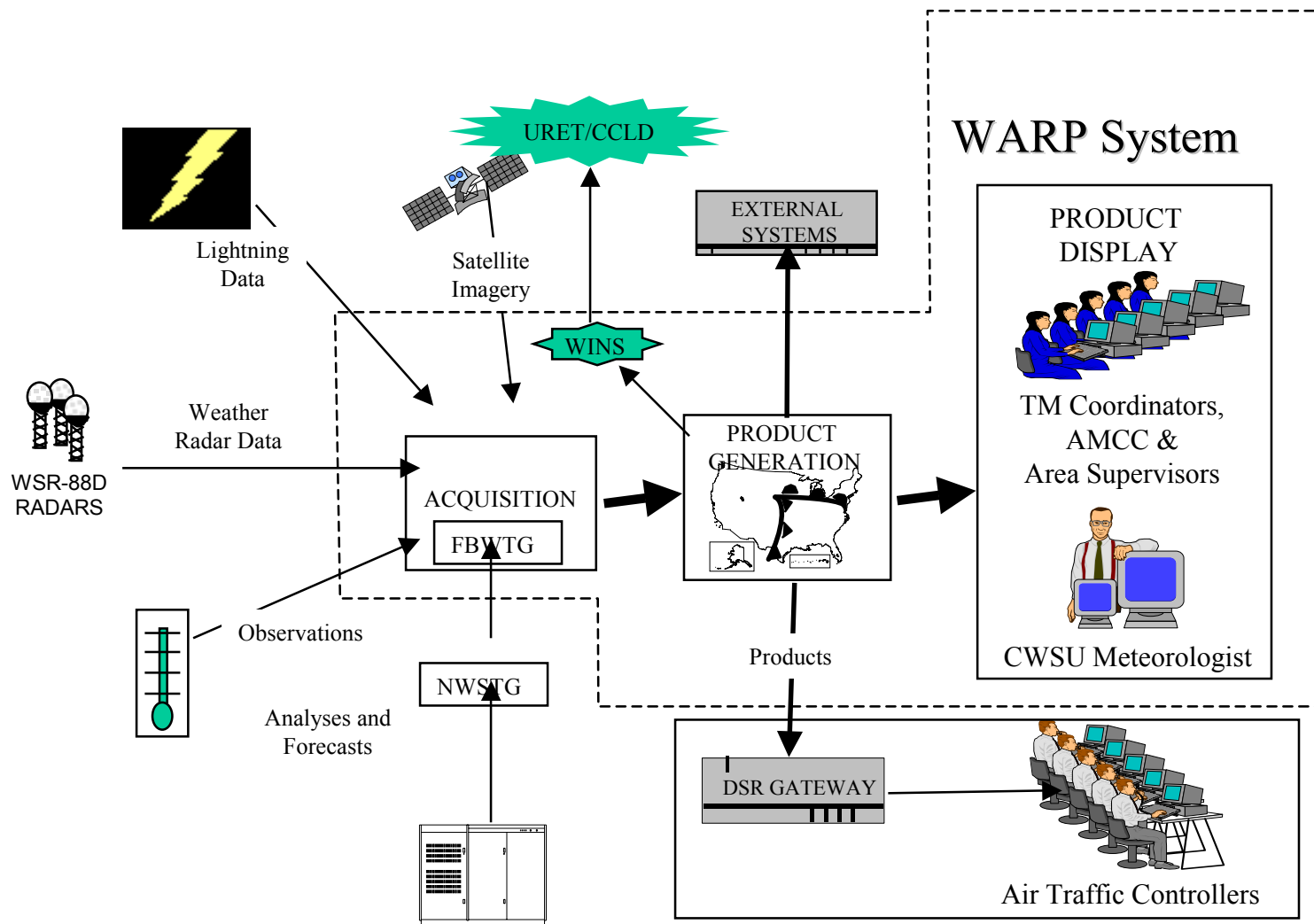
**CWSU Weather Workstation**



**ATC Controller DSR Display**

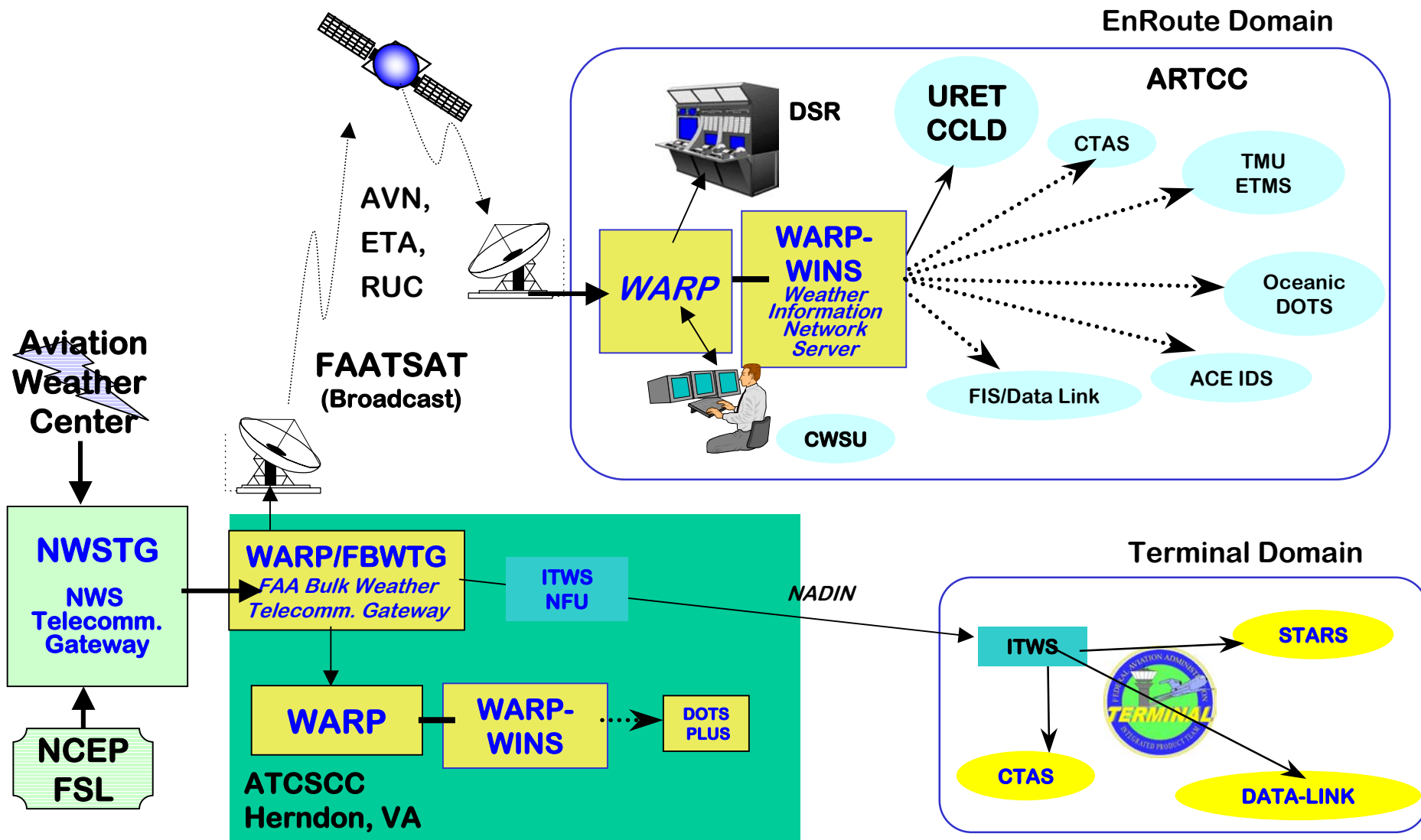


# WARP Top Level Data Flow





# WINS Architecture











# ***Integrated Terminal Weather System (ITWS)***

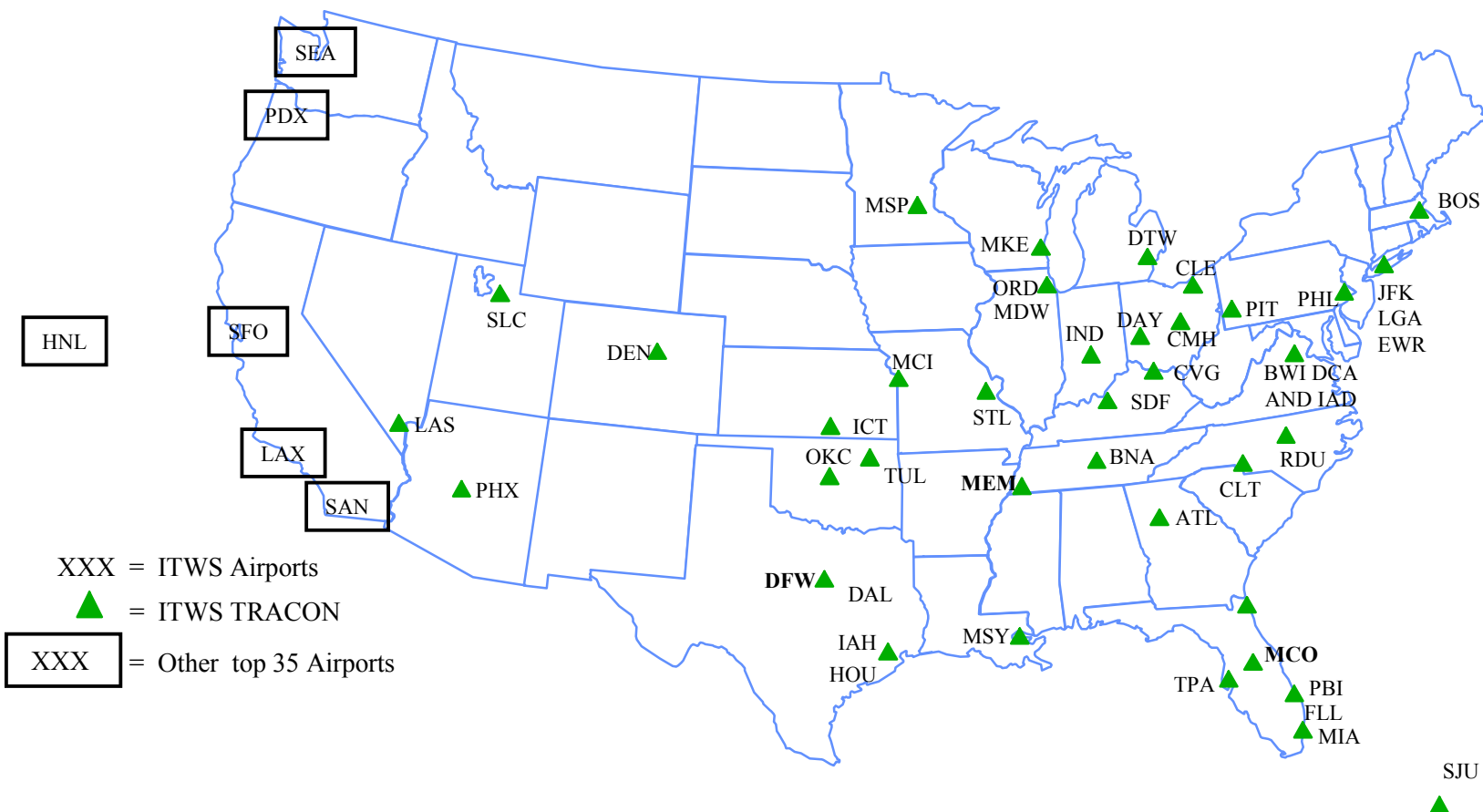
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## **Objectives:**

-  Primary integrated weather system for the terminal environment
-  Provides detection and short-term prediction of terminal weather through the integration of data from:
  -  FAA/National Weather Service sensors and systems, and
  -  Aircraft in flight
-  Provides weather information that is immediately useable without further meteorological interpretation
-  Reduce delays, increase safety, and terminal capacity



# ITWS Terminals





# ITWS Products

## External Inputs

TDWR

LLWAS

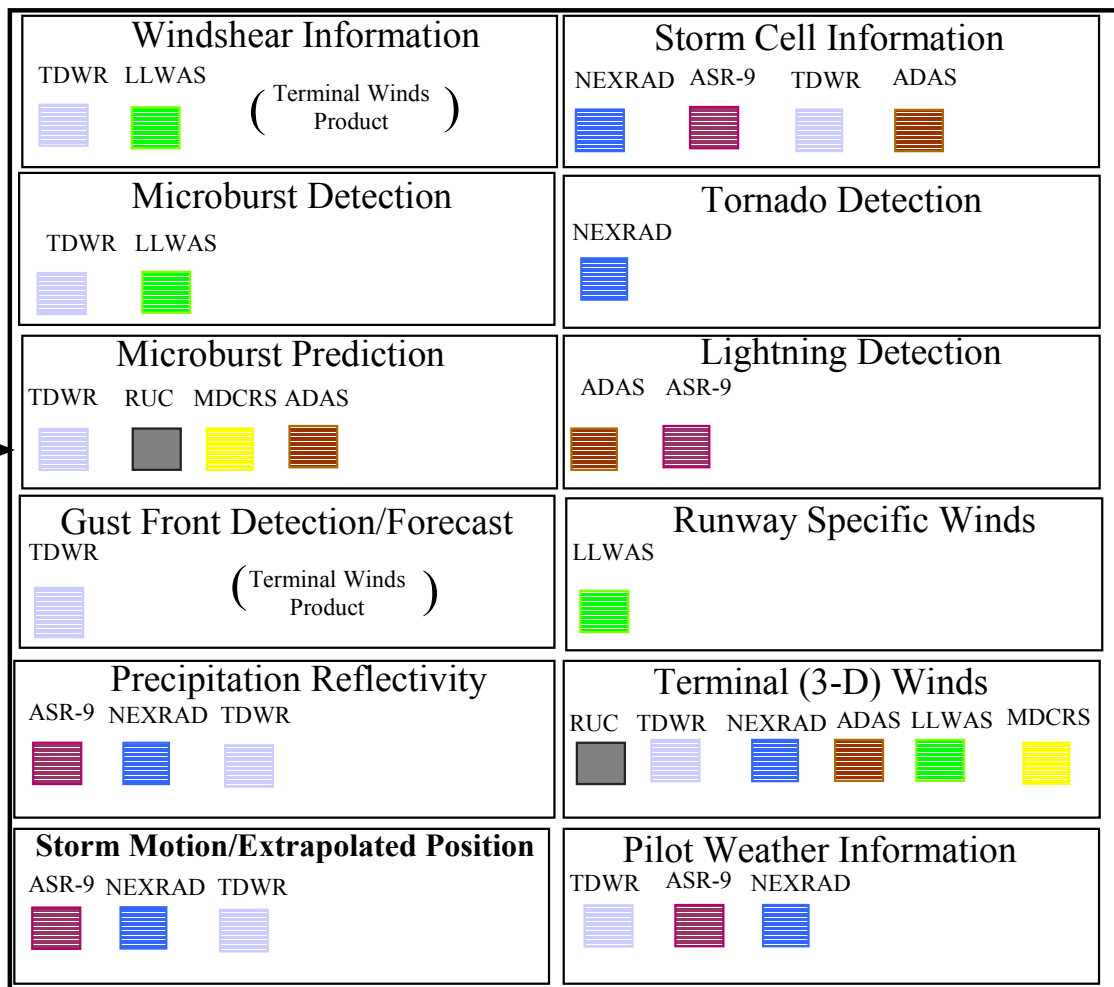
NEXRAD

ADAS

MDCRS

ASR-9

RUC

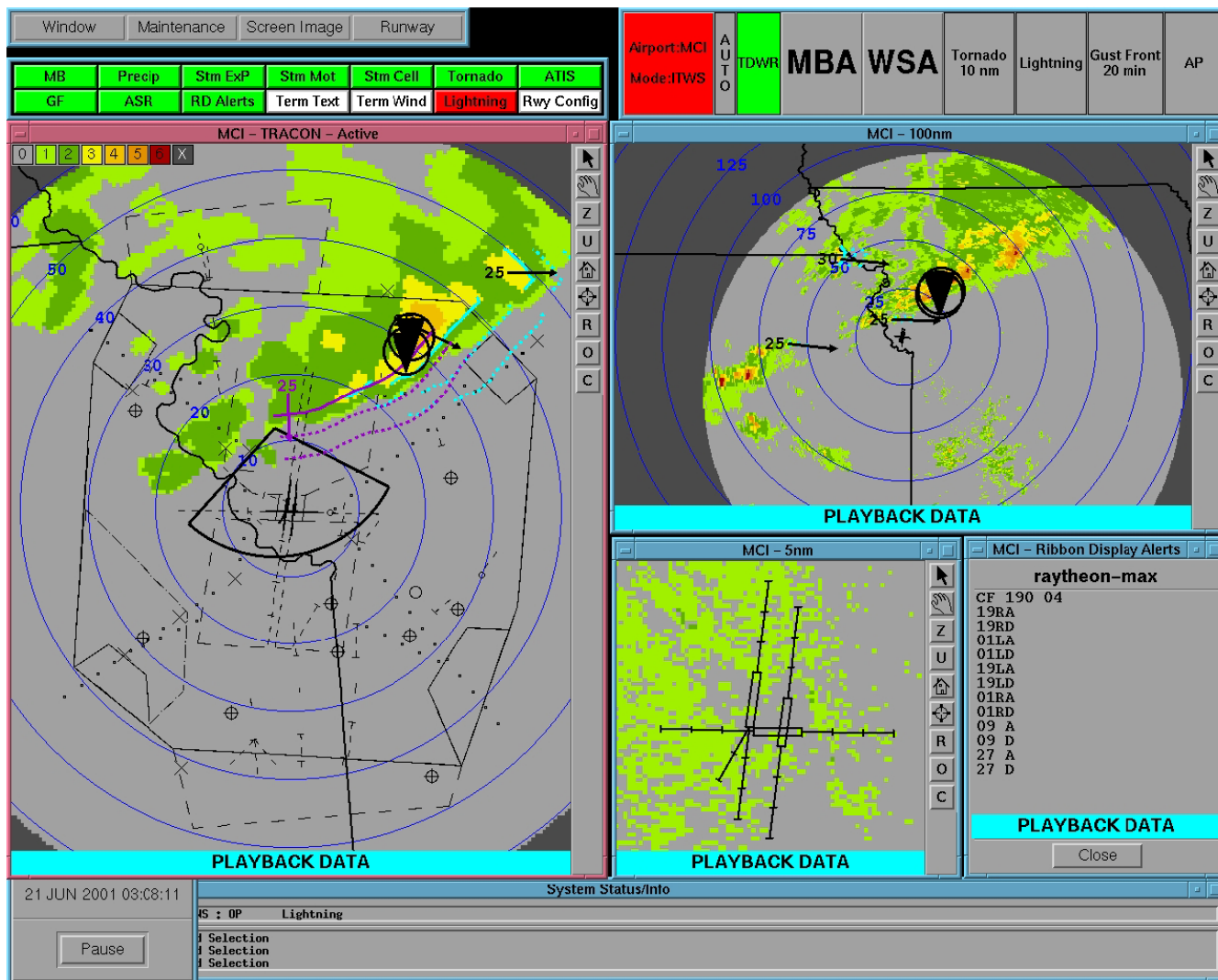


Note-not all inputs shown





# Sample ITWS Display





# ***Corridor Integrated Weather System (CIWS)***

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## **Objective:**



Provide convective weather products (forecast/precipitation) for traffic management in multi-domain area to reduce convective weather delays



## **Approach:**



Based on ITWS technology currently being used operationally



Centralized product generation



## **Status:**



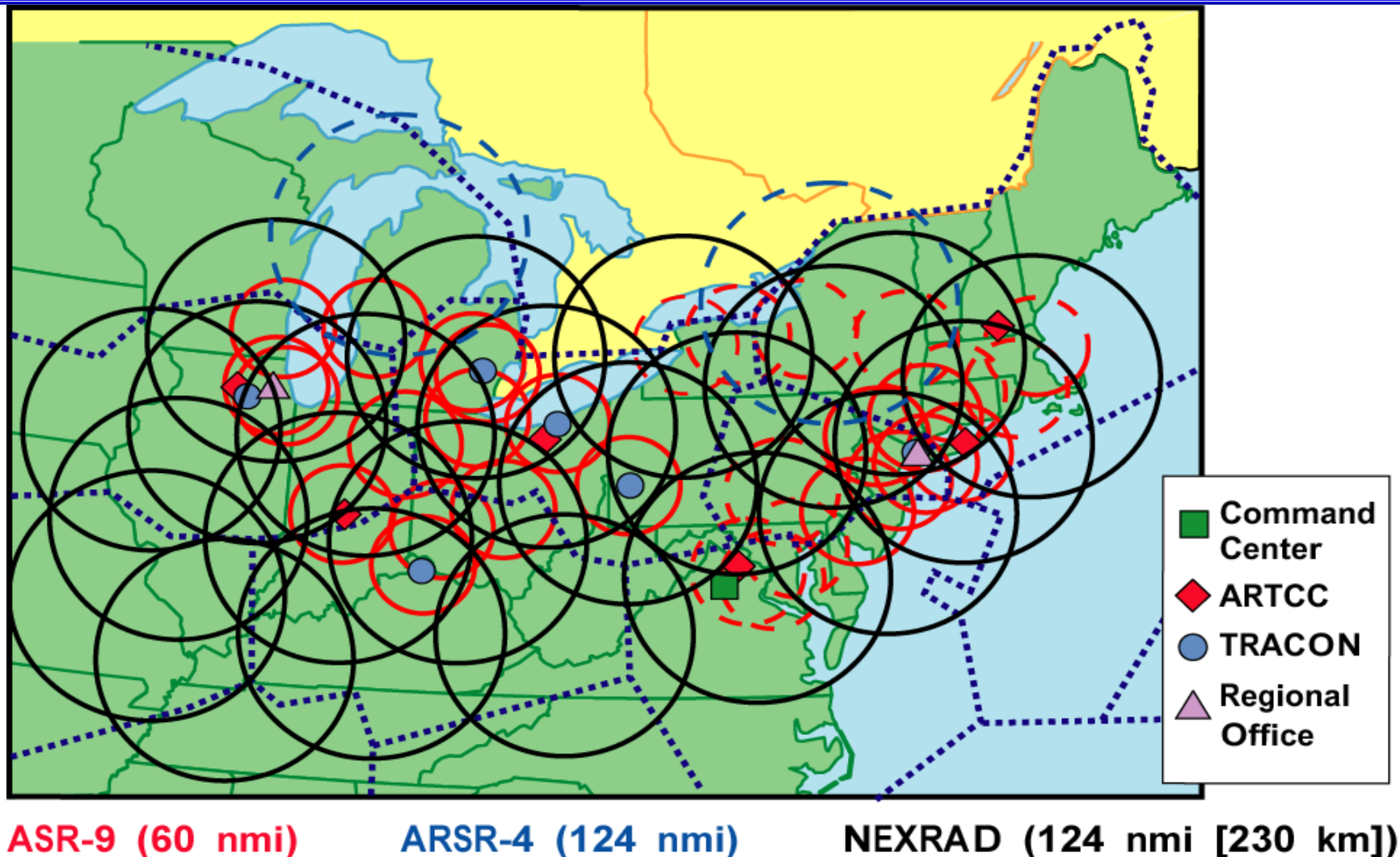
Operational Concept Demonstration



Cleveland Corridor area of coverage



# CIWS Sensor Coverage for 2002





# ***Operational and Supportability Implementation System (OASIS)***

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## **Objective:**



Replace Model 1 Full Capacity (M1FC) with enhanced flight planning functionality and weather products which incorporate Graphic Weather Display System (GWDS) and DUAT



## **Status:**



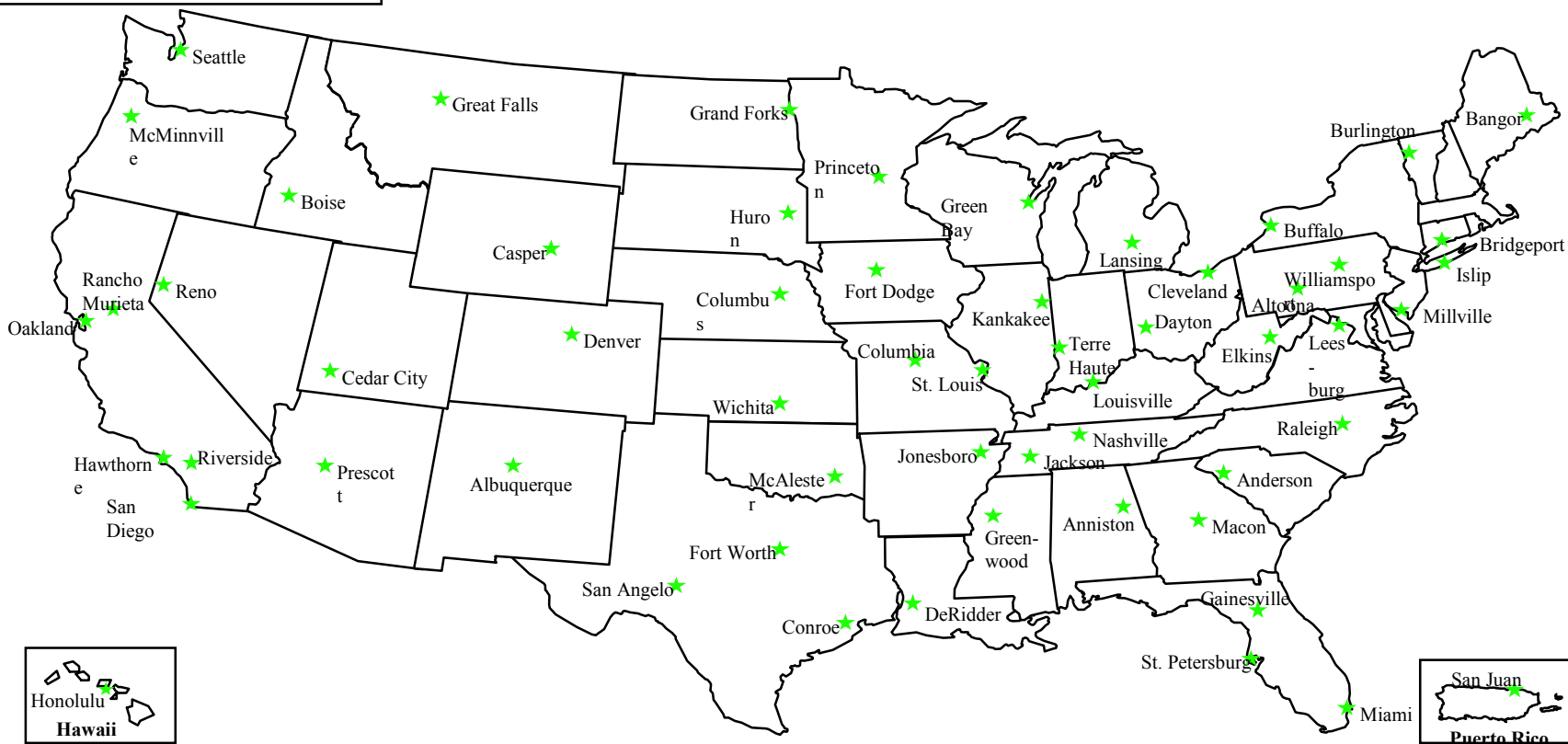
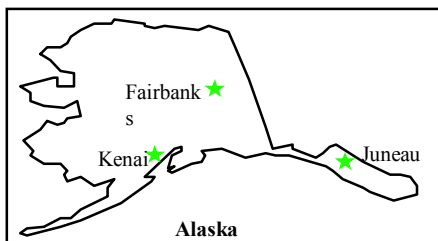
Solution Implementation



Install up to 61 operational and 3 support system

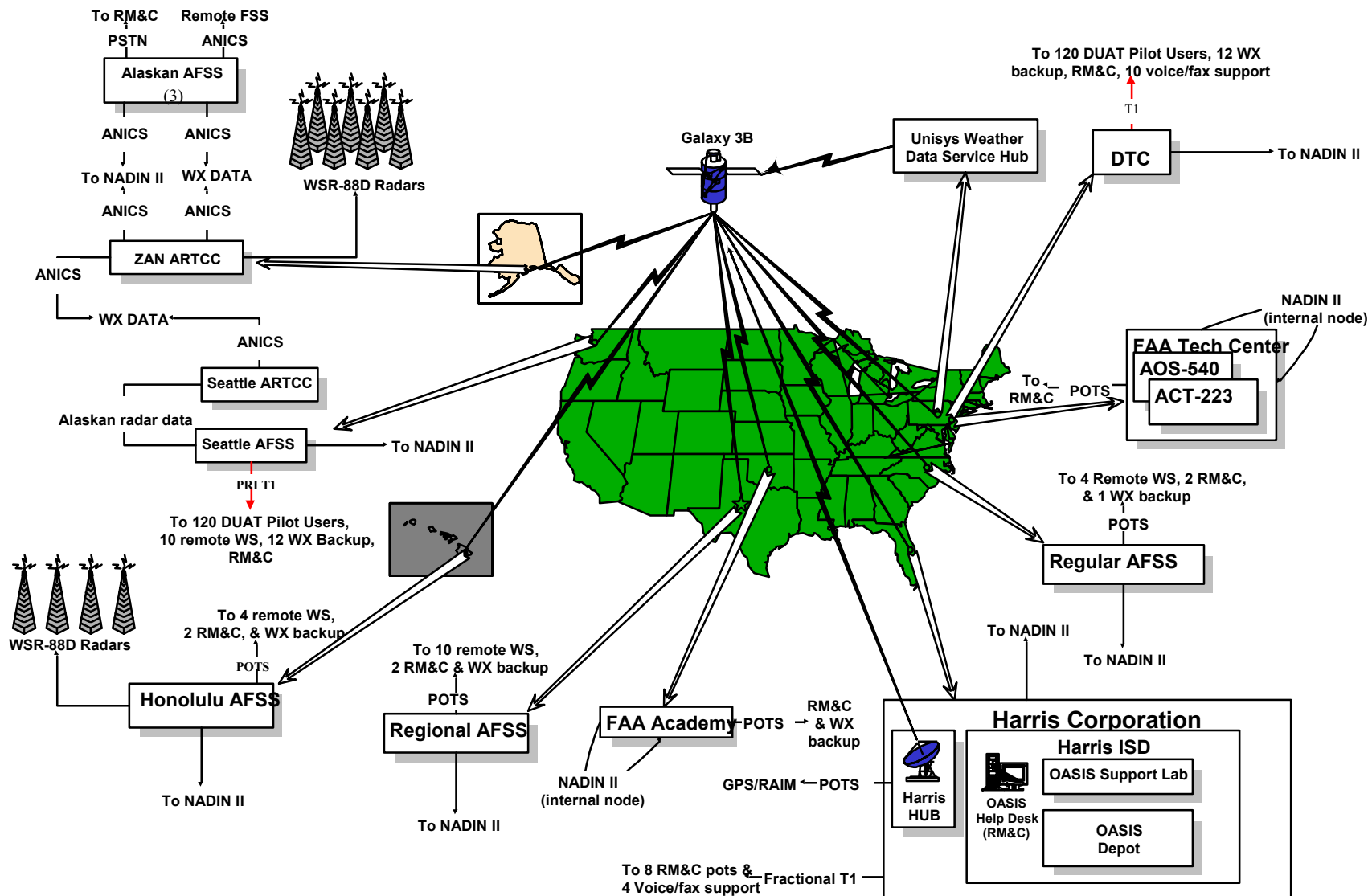


# OASIS Locations





# External Interfaces - National View





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# ***Flight Information Services Data Link (FISDL)***



# ***FIS Data Link (FISDL)***



## **Objective:**



Support FAA Safer Skies initiative to reduce aviation accidents and fatalities

- ★ Provide better information for pilot decision-making (i.e., avoiding hazardous weather)
- ★ Reduce radio communications (i.e., controller/flight service relay of weather conditions)



## **Approach**



Use private sector's FIS capabilities ...to bring FIS services and products to the market place quickly and efficiently






- ★ Implementation based on FAA Airborne FIS Policy Statement, May 1998
- ★ FAA signed Government-Industry Project Performance Agreements (G-IPAs) with two FISDL service providers (ARNAV and Honeywell)





# ***G-IPPA: Key FAA Provisions***

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-  **Five year agreement through September 2004; decision for extension in January 2003**
  -  Access to 4 VHF channels (136 MHz “protected” spectrum) with spectrum engineering support
  -  Access to FIS/Weather data within FAA systems
-  **Publish ACs, other publications, and necessary standards**
-  **Sponsor studies to develop applications/benefits & NAS changes**



# ***G-IPPA: Key Industry Provisions***



## **System infrastructure and service at no cost to FAA**



Full national coverage (CONUS)



Access from at least 5000' to 17,500'; sfc to 45,000' desired



## **Products designed for aviation use and based on approved data sources**



Conform to guidelines (ICAO, RTCA, SAE G10) for cockpit display



Basic products at no fee (METAR/SPECI, TAF/AMEND TAF, SIGMET, Conv SIGMET, AIRMET, PIREPs, Alert Wx Watches)



Valued-added products for fee



## **Education/training materials for pilot users and FAA**



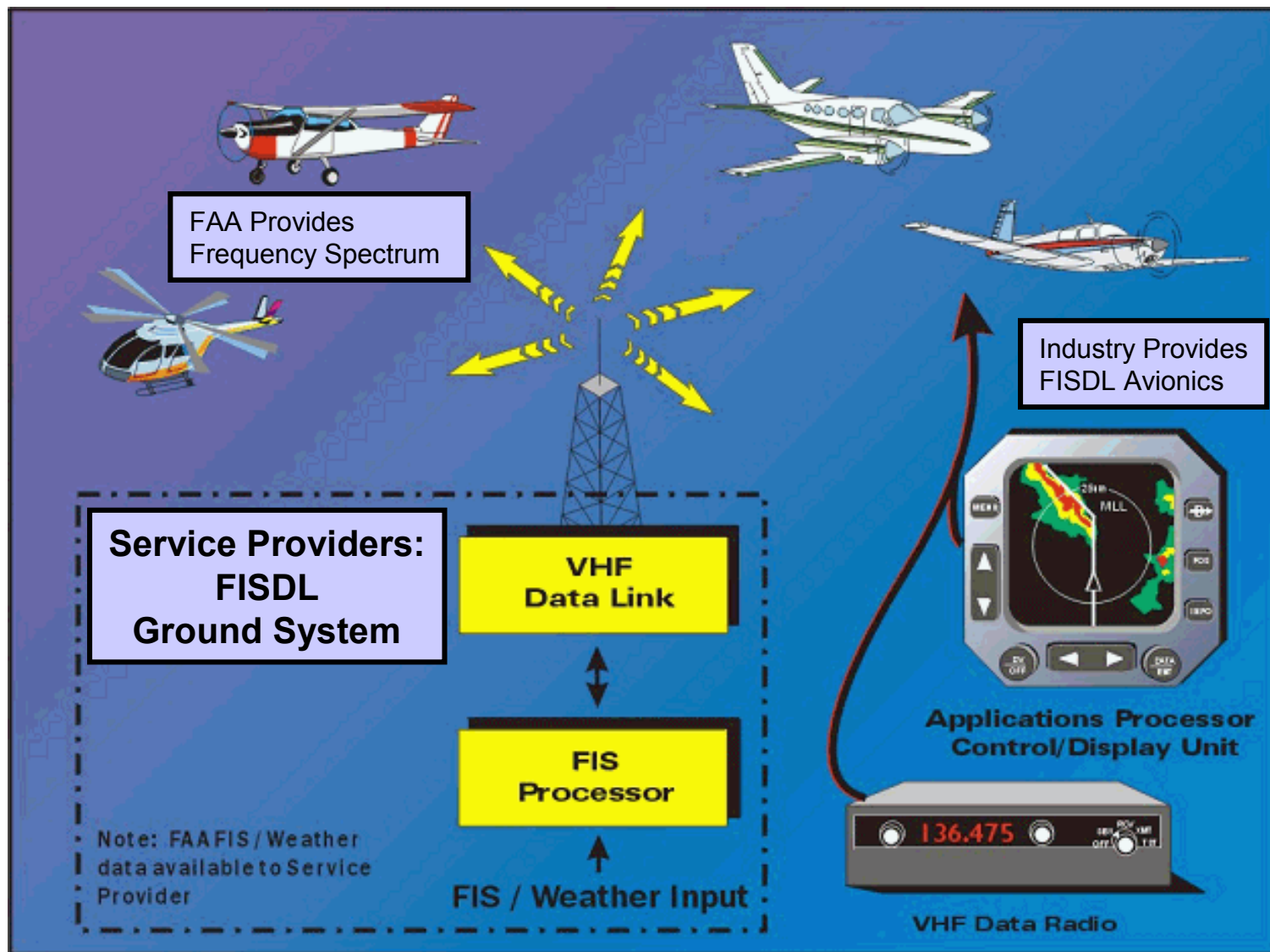
## **Archive all broadcast transmissions for at least 15 days**



## **Quality assurance that addresses system risks and user concerns**



# FISDL System Overview





# ***FISDL Status***

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## **Deployment**



ARNAV has FCC site licenses for 52 ground stations; no sites yet providing operational service



Honeywell has over 65 operational sites covering Eastern Half of CONUS and spreading west into California; 120 sites planned by end of 2002; total network reaches over 200 sites in 2003



## **Products**



ARNAV has two graphics and METAR text approved

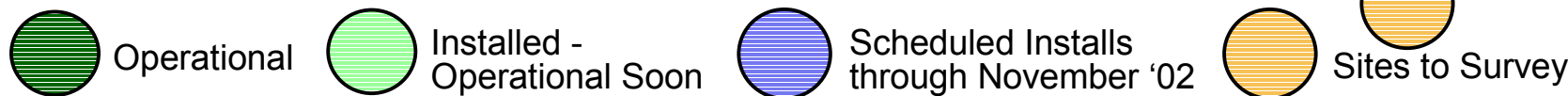
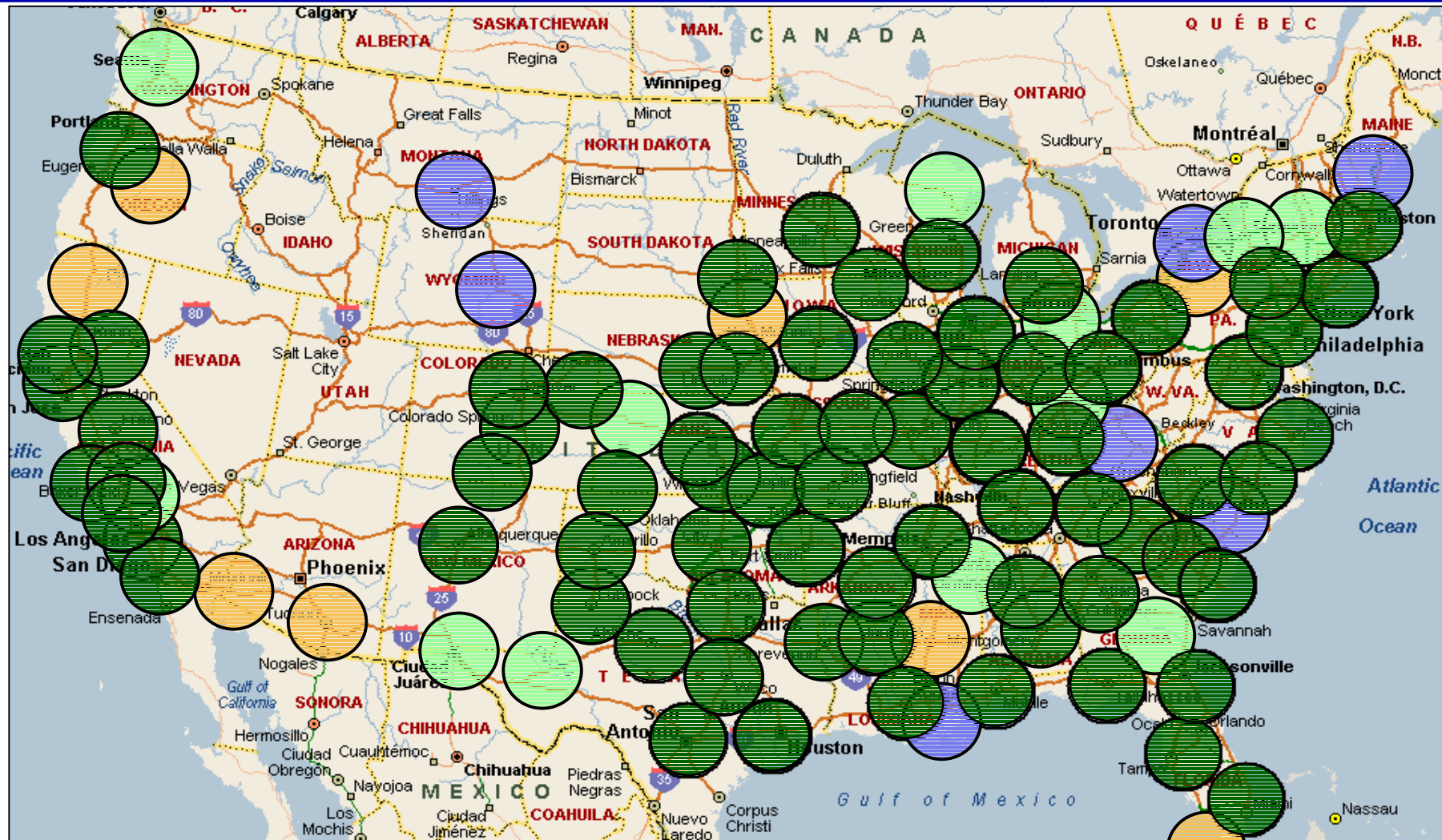


Honeywell is transmitting two graphics; and METAR, TAF, PIREP textual products



# Honeywell Ground Stations

5,000 feet AGL





# ***FISDL Technology Issues/Concerns***



## **Transition strategy to define FAA role(s) in future NAS FIS data link service**



FAA/NASA studies on communications alternatives



FAA/NASA studies on implementing GA Automet (TAMDAR) services



## **Standards and Guidelines to support interoperability and user applications**



Revisions to RTCA FIS-B MASPS



Expand guidelines on appropriate use of colors for cockpit displays



Develop plain language decoder for METAR text



Develop format for data link transmission of gridded products



# ***FISDL Technology Issues/Concerns - 2***

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## **User education/training to ensure appropriate use(s) in cockpit decision making**



FAA/NASA study on cockpit displays of looping NEXRAD and/or NCWF



Publication of education/training aids on FISDL weather products characteristics (capabilities and limitations)



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# ***Flight Information Services – Broadcast (FIS-B)***

## ***Safe Flight 21 (SF 21)***










# ***Flight Information Services--Broadcast***

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## **Objectives:**

-  Provide selected FIS-B textual and graphical weather products to National Airspace System (NAS) users as a government-furnished service
  -  Use Airport Surface Detection Equipment–X (ASDE-X) surface infrastructure.
-  Support FAA's Mission Goal to reduce U.S. aviation fatal accident rates by 80 percent by 2007 (from 1996 levels).
-  Develop and implement beneficial ADS-B applications
  -  Consistent with the FAA's surveillance data link decision, using:
    - Universal Access Transceiver (UAT), and
    - 1090 MHz



# ***FIS-B Status***



## **Current Status:**



FAA ADS-B data link decision 7/02



ASDE-X current baseline does not support FIS-B uplink



UAT Minimum Operational Performance Standards (MOPS) approved 8/02 by RTCA.



## **Future Milestones**



FIS-B uplink capability on ASDE-X planned as product improvement



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# ***Next Generation Air-Ground Communications (NEXCOM)***





# ***NEXCOM Objective***



## **Provide a digital voice and data-capable air/ground communications system to support pilot/controller communications in the National Airspace System**



Relieve spectrum congestion in the Air Traffic Control VHF Band (117.95-137.0 MHz)



Projected saturation by 2009



Lack of frequencies would prevent establishment of new sectors and other measures aimed at increasing NAS capacity



Provide data link capability for air traffic control and management (e.g. control instructions, weather info)



Replace aging analog ground equipment



Average age 25+ years



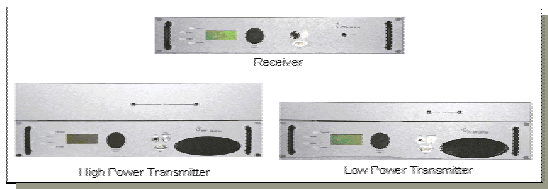
Sustainment challenges increasing



# NEXCOM

## Acquisition Program Status

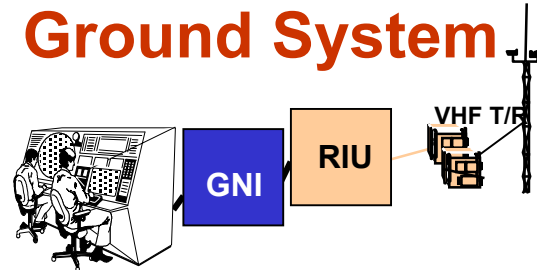
### Multimode Digital Radio



#### *Analog & digital in one radio*

- Replaces FAA ground radios
- Fielding begins Spring 2003

### Ground System



#### *Digital capability*

- Development 2002-2007
- Fielding begins FY08

### Avionics



#### *Analog & digital in one radio*

- Gov't-Industry Dev Agreements
- Goal: Certified avionics by mid-2004

### System Demo Program

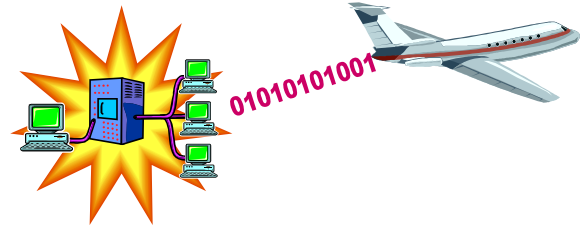


#### *VDL-3 technology, system architecture & commercial avionics*



# ***NEXCOM Technology Issues/Concerns***

## **System Demonstration Program**



### **Series of three demonstrations**

- ☁ Oct 02, Oct 03 at FAA Tech Center
- ☁ Oct 04 at an operational site

### **Objectives**

- ☁ Oct 02: VDL Mode 3 Technology viability
- ☁ Oct 03: NEXCOM Architecture feasibility
  - ★ Vendors provide pre-production avionics
- ☁ Oct 04: Operational suitability (voice)
  - ★ Commercial avionics



# *Summary*

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## **Weather Products**



FAA Weather Product research & development through FAA AWRP program



NASA coordination and support well established



## **Weather Data Link**



FAA Weather data link communications primarily through FAA FISDL program (currently)



NASA coordination and support well established